CLAIMS

1. A method of producing a composite material having a matrix phase and a dispersed phase, comprising:

powder injection molding a matrix powder feedstock to form a matrix component , the matrix powder feedstock comprising a powder of a matrix phase material mixed with a first binder ;

powder injection molding an infiltrant powder feedstock onto a surface of the matrix component , the infiltrant powder feedstock comprising a powder of a dispersed phase material mixed with a second binder, to form an infiltrant layer, thereby forming a composite system of the matrix component and the infiltrant layer;

removing the binders from the composite system; and

sintering the composite system, thereby coalescing the matrix component into the matrix phase having a network of interconnected pores, and causing infiltration of the infiltrant layer into the pores of the matrix phase to form the dispersed phase.

2. The method according to claim 1, further comprising coating a surface of the matrix component with wax solution prior to molding of the infiltrant powder feedstock onto the surface of the matrix component.

3. The method according to claim 1, wherein the infiltrant powder feedstock is powder injection molded onto one or more pre-determined locations of the surface of the matrix component.

4. The method according to claim 1, wherein the matrix phase material has a higher melting point than that of the dispersed phase material.

5. The method according to claim 1, wherein the first and second binders are the same.

6. The method according to claim 1, wherein the matrix phase material is selected from the group consisting of tungsten, tungsten carbide, silicon carbide, iron, and any combination thereof.

7. The method according to claim 6, wherein the matrix powder feedstock comprises a tungsten PIM feedstock, with a tungsten solid volume loading in the region from 38 to 55 percent.

8. The method according to claim 1, wherein the dispersed phase material is selected from the group consisting of copper, nickel, cobalt and any combination thereof.

9. The method according to claim 8, wherein the infiltrant powder feedstock comprises a copper PIM feedstock, with a copper solid volume loading in the region from 45 to 60 percent.

10. The method according to claim 1, wherein the binder comprises 50 weight% polypropylene, 45 weight% paraffin wax, 3 weight% stearic acid and 2 weight% carnauba wax.

11. The method according to claim 1, wherein removing the binder from the composite system is achieved by solvent debinding.

12. The method according to claim 1, wherein removing the binder from the composite system is achieved by thermal debinding.

13. The method according to claim 1, wherein removing the binder from the composite system is achieved by a combination of solvent and thermal debinding.

14. The method according to claim 1, wherein the amount of infiltrant powder feedstock molded onto the surface of the matrix layer is pre-selected.

15. The method according to Claim 11, further comprising pre-selecting said amount of infiltrant powder feedstock which results in the smallest difference in shrinkage between the matrix component and the infiltrant layer at the debinding temperature range.

16. The method according to claim 1, wherein molding the matrix powder feedstock and the infiltrant powder feedstock are performed using a double barrel injection molding apparatus.

17. A composite material having a matrix phase and a dispersed phase, produced by a method comprising:

powder injection molding a matrix powder feedstock to form a matrix component, the matrix powder feedstock comprising a powder of a matrix phase material mixed with a first binder ;

powder injection molding an infiltrant powder feedstock onto a surface of the matrix component, the infiltrant powder feedstock comprising a powder of a dispersed phase material mixed with a second binder, to form an infiltrant layer, thereby forming a composite system of the matrix component and the infiltrant layer;

removing the binders from the composite system; and

sintering the composite system, thereby coalescing the matrix component into the matrix phase having a network of interconnected pores, and causing infiltration of the infiltrant layer into the pores of the matrix phase to form the dispersed phase.